Oenothera gayleana (*Oenothera* sect. *Calylophus,* Onagraceae), a new gypsophile from Texas, New Mexico, and Oklahoma

B. L. Turner
Plant Resources Center, The University of Texas, Austin, TX, 78713, billie@uts.cc.utexas.edu

and

Michael J. Moore
Department of Biology, Oberlin College, Oberlin, OH, 44074, michael.moore@oberlin.edu

ABSTRACT

A new species, *Oenothera gayleana*, is described from gypseous soils in western Texas (Panhandle and trans-Pecos areas), southeastern New Mexico, and western Oklahoma. It is closely related to *O. capillifolia* subsp. *berlandieri* of sect. *Calylophus* but is readily distinguished by its consistently longer, linear, essentially entire leaves, and restriction to bare gypseous outcrops. Photographs of plants in the field, as well as the type, are provided, along with maps showing its distribution and that of its closest congener, *O. capillifolia*. Published on-line **www.phytologia.org** *Phytologia 96(3): 200-206 (July 1, 2014).* ISSN 030319430

KEY WORDS: *Calylophus,* gypsum, *Oenothera, O. capillifolia, O. berlandieri,* Onagraceae, *Zeltnera maryanna*

Oenothera gayleana B. L. Turner & M. J. Moore, **sp. nov**. Figs. 1, 2.
Resembling *Oenothera capillifolia* subsp. *berlandieri* (Spach) Wagner & Hoch [= *O. berlandieri* (Spach) D. Dietr., cf. Wagner, Krakos and Hoch 2013] but the leaves linear to linear-oblanceolate, 10-20 times longer than wide (vs 10 times longer than wide or less), having nearly entire/slightly serrate margins (vs serrate), and the floral tubes somewhat shorter (ca. 7 mm long or less, vs longer).

Stiffly erect suffruticose perennials 15-30(-40) cm high and about as wide, the stems decidedly ascending and arising from woody taproots with caudices 0.5-2.0 cm (occasionally to 3 cm) in diameter. **Leaves** conduplicate, linear to narrowly linear-lanceolate, not much reduced upwards, those at mid-stem mostly 25-35 mm long, 1-2 mm wide, 10-15(-20) times as long as wide, sparsely strigose to glabrous, the margins nearly entire to slightly serrate. **Sepals** 4-6 mm long, 3-4 mm wide, weakly appendaged, if at all. **Floral tubes** yellow throughout, ca. 7 mm long, ca. 5 mm across apically. **Petal lobes** yellow, 15-20 mm long, 10-15 mm wide. **Stamens** biseriate, the episepalous filaments ca. 5 mm long; epipetalous filaments ca. 2 mm long; anthers 3-4 mm long. **Styles** ca. 10 mm long; stigma discoid, yellow, ca. 2 mm across. **Capsules** linear-arcuate, moderately strigose, 18-20 mm long, ca. 2 mm wide. **Seeds** oblanceolate, glabrous, ca. 1.5 mm long, 1.0 mm wide. **Chromosome number**, n = 7, including varying numbers of pairs and rings (as cited below). **Flowering** known from early May through late September.

TYPE: **USA. TEXAS: Culberson Co**., 13.1 mi E along FM 652 from its intersection with US 62/180, bare gypsum hills, 25 May 2004, *B. L. Turner 24-255*. (Holotype: TEX; isotypes: BRIT, MO, SRSC).

ADDITIONAL SPECIMENS EXAMINED: **NEW MEXICO. De Baca Co.:** Gypsum land 24 mi S of Ft. Sumner (Route 20), 17 Aug 1967, *J. B. Secor 61* (TEX); Along NM 20, ca. 28 mi south of junction with US 80 in Fort Sumner, 34 09 17.7 N, 104 28 51.6 W; in gypsum, 12 Aug 2008, *M. J. Moore et al. 669* (US). **Eddy Co.:** 11.4 mi S of Whites City on US 62/180, 9 May 1967, *H. F. Towner 21* [The collector

(on the sheet itself) notes three chromosome counts in this population: 2n = 7 pairs; 2n = 5 pairs + 1 ring of 4 chromosomes; and 2n = 2 pairs + 1 ring of 4 chromosomes, 1 ring of 6 chromosomes, and 2 diminutive chromosomes.]; 15 mi S of Whites City, 2 mi E along hiway 180, "Growing in pure gyp. soil," 22 May 1967, *B. L. Turner 5664* (TEX); ca. 1 mi from Texas/New Mexico line along US 62; gypsum soils, 18 Aug 2004, *B. L. Turner 24-411* (TEX); Along US 62/180 ca. 5.2 mi N of jct w/ FM 652, 32 02 36.9 N, 104 28 10.3 W, in gypsum, 10 Aug 2008, *M. J. Moore et al. 653* (US); At east end of Seven Rivers Hills, near gravel road that leads from US 285, N of Carlsbad, 32 33 41.7 N, 104 25 33.8 W, on gypsum, 11 Aug 2008, *M. J. Moore et al. 660* (US); Along gravel road leading east from US 62/180, in Yeso Hills, 32 02 25.1 N, 104 27 25.9 W, on gypsum, 26 May 2012, *M. J. Moore 1758* (US); Yeso Hills, ca. 0.5 mi along gravel road leading east from US 62/180, 32 02 13.9 N, 104 27 18.8 W, on gypsum, 20 Aug 2013, *M. J. Moore et al. 2286* (US).

OKLAHOMA. Harmon Co.: 13.5 mi W of Mangum, gypsum, 3 Jun 1948, *U. T. Waterfall 7766* (TEX).

TEXAS. Collingsworth Co.: N side of Elm Creek canyon on Elm Creek Ranch, ca. 7.2 airmiles SE of jct. I-10 and US Rt. 83 in Shamrock, 35 08 19.6 N 100 10 16.4 W, gypsum outcrops, 2150 ft, 18 Sep 2007, *W. R. Carr et al. 26378* (TEX). **Culberson Co.:** about half [way] between El Paso-Carlsbad road [US 62/180] and Delaware Creek, 5 Jul 1952, *L. C. Hinckley 4862* (SRSC); low gyp hills, ca. 13 mi W of [Reeves] county line, 24 Jun 1970, *A. M. Powell 1921* (SRSC); 22.4 mi W of Reeves Co. line along hiway 652, gypsum knolls, 1 Aug 2000, *B. L. Turner 20-445B* (SRSC, TEX); ca. 19.5 mi E along hiway 652 from its intersection with US 62, 18 Aug 2004, *B. L. Turner 24-411* (TEX); Just N of gravel road that goes E from FM 2185, 31 21 05.5 N, 104 27 06.6 W, on gypsum, 25 Aug 2013, *M. J. Moore et al. 2354* (US). **Dickens Co.:** S of US highway 82, 24 Jun 1944, *C. L. Lundell 12979* (TEX); Croton Breaks, ca. 15 mi ESE of Dickens along gypsum ridges, 29 Sep 2004, *Turner 24-454* (SRSC, TEX); 6.4 mi S of US Hwy 82 on road to Croton Camp of the Pitchfork Ranch (i.e., 15.2 mi E from Dickens on 82, then S 3.9 mi on Co Rd 371, then SW 2.5 mi on Co Rd 366), in the Croton Breaks, 33 32 49 N, 100 37 36 W, 10 Jul 2000, *T. L. Wendt & K. Collins 7124* (TEX); Along Dickens County Road 371 ca. 0.8 mi south of junction with US 82, 33 36 12.0 N, 100 34 10.5 W, on gypsum hillside, 22 Jul 2009, *M. J. Moore et al. 790* (US).

In Towner's (1977) biosystematic study of *Calylophus*, material of this taxon was not cited, although in his account of the "Distribution" of *C. berlandieri* subsp. *berlandieri* he alludes to collections from Culberson County, Texas; in his well-crafted treatment the present novelty will key to or near *C. berlandieri* subsp. *berlandieri* (= *O. capillifolia* subsp. *berlandieri*) and/or subsp. *pinifolia* (Engelm. ex A. Gray) Towner (= *O. capillifolia* subsp. *capillifolia*). *Oenothera gayleana* is readily distinguished from both subspecies in having longer, linear, nearly entire leaves and by its somewhat smaller flowers, as given in the above diagnosis. The reduced leaf morphology of *O. gayleana* is typical of the overwhelming majority of gypsum endemic species worldwide (Escudero et al., 2014) and may represent an edaphic adaptation to growing on gypsum; it also shares with most gypsum endemic taxa a more shrubby habit compared to its near relatives. Indeed, the taxon has a very compact, highly branched habit with a single strong caudex that can grow as much as 3 cm in diameter in older individuals.

Towner (1977) perceptively noted that "extremely narrow-leaved plants formerly known as *Oenothera serrulata* subsp. *pinifolia* are clearly variants which can actually be found along with broader-leaved plants in populations of either subspecies of *C. berlandieri*." He further commented that his treatment was similar "to that of Shinners (1946), who did not recognize subsp. *pinifolia*, viewing it as merely the extreme in a wide range of variation, the latter due to spontaneous mutation. The narrow-leaved plants are most frequently found in areas of highly calcareous soil, including gypsum, and they occur in the more arid portions of the range of *C. berlandieri*. Thus their presence may well be due not to spontaneous mutations, but to edaphic selection factors." The above remarks are perceptive and presage recognition of the present taxon.

We also recognize that the present novelty might with equal validity be recognized as but a localized variety or subspecies of *O. capillifolia* subsp. *berlandieri*; indeed, Towner himself annotated the Dickens Co. populations as such (cf. *Lundell 12979*, TEX). Nevertheless, the distinctive leaves, habit, and habitat of the gypsum populations, which are maintained across a broad area of discontinuous gypsum exposures in three states (Fig. 3), are suggestive of specific status. Populations of *O. capillifolia* subsp. *berlandieri* away from gypsum are generally taller (as much as 1 m tall) with longer internodes, wider leaves, and a laxer overall habit, as for example seen in populations on the quartz sand dunes near Monahans, TX [e.g., *M. J. Moore et al. 757*, Ward County, TX (US)]. Workers in the future using DNA data might help resolve such alternatives. So far as known, it does not co-occur with subsp. *berlandieri*, nor does it appear to intergrade into contiguous populations of that taxon in regions to the north or east. The distributions of *Oenothera capillifolia* and its infraspecific taxa are shown in Fig. 4.

Throughout most of its range, *Oenothera gayleana* grows intermixed with the much larger-flowered *O. hartwegii* subsp. *filifolia*, without evidence of hybridization (cf. *Turner 20-445B*, TEX). In the northern part of its range, *Oenothera gayleana* occasionally occurs near the superficially similar *O. serrulata* Nutt. of sect. *Calylophus*, a permanent translocation heterozygote taxon (Towner, 1977) that is distinguished by its more prominently serrate leaves and generally smaller flowers.

The senior author has named the taxon for his wife of ca. 25 years, Gayle Turner (nee Langford), but now divorced, mainly because he had previously described *Centaurium maryannum* [= *Zeltnera maryanna* (B.L. Turner) Mansion; Turner, 1993] from these same gypseous outcrops, this in honor of Mary Ann Langford, Gayle's mother. The idea that both mother and daughter are endearingly eponymized as part of this localized edaphic setting gives him pleasure. It is his hope that future floristic workers will call attention to this romantic quirk, making the natural habitat concerned more memorable for such bestowal.

As an aside, the senior author takes a sort of ironic pleasure in calling the reader's attention to the fact that when he first met Gayle (while she was dating a young dentist-to-be, both enrolled in my Native Plants course at the University of Texas), her erstwhile paramour referred to her lovingly as "his little *Oenothera*." The present description makes prescient his presentiments, albeit in on the senior author's behalf; he naturally picked up on the eponym, often referring to her as "my little *Calylophus*," this prior to the resubmergence of the latter into *Oenothera*, sensu lato (Wagner et al., 2007).

Biogeographic observations. *Oenothera gayleana* forms a part of a distinctive florula of gypsophiles with a center of distribution in southeastern New Mexico and adjacent Culberson County, Texas (Waterfall, 1946). This florula includes several taxa that are restricted to this area: *Abronia nealleyi* Standley (cf. Turner, 2004; Ackerfield and Jennings, 2008), *Anulocaulis leiosolenus* (Torr.) Standl. var. *gypsogenus* (Waterf.) Spellenb. & T.Wootten, *Astragalus gypsodes* Barneby, *Eriogonum gypsophilum* Wooton & Standl., *Linum allredii* R.C.Sivinski & M.O.Howard, *Senecio warnockii* Shinners, and *Zeltnera maryanna* (B.L. Turner) Mansion. Interestingly, none of the above taxa, including *O. gayleana*, is known to grow west of the Guadalupe Mountains. Three of these taxa (*L. allredii, O. gayleana,* and *Z. maryanna*) have been described in the past 21 years (Turner, 1993; Sivinski and Howard, 2011), suggesting that further exploration and study of specimens already collected in the area, particularly on the large gypsum plains of the Castile Formation (e.g., King, 1948; Weber and Kottlowski, 1959), which extend almost 90 km north to south, may yield additional undescribed taxa. This is particularly true of the Texas portions of this deposit, which are much more extensive and less well explored botanically.

It is important to note that *Oenothera gayleana,* while a common and conspicuous element of the gypsum exposures in southeastern New Mexico and Culberson County, is not restricted to this area, unlike the taxa mentioned above. The disjunct populations of *O. gayleana* on the large gypsum deposits

of north Texas and western Oklahoma seem unusual at first, although other taxa restricted to gypsum in this area share similar disjunctions. The gypsophilic *Nama stevensii* C.L.Hitchc. var. *stevensii* shares a similar overall distribution to *O. gayleana*, although it extends further north into Oklahoma and southern Kansas (Tyrl et al., 1984). Likewise, *O. hartwegii* Benth. subsp. *filifolia* (Eastw.) W.L.Wagner & Hoch, another gypsophilic member of sect. *Calylophus* that is ubiquitous on gypsum throughout New Mexico and west Texas, also grows on gypsum north of Big Spring, TX (Towner, 1977). Finally, *Haploësthes greggii* var. *texana*, which is confined to gypsum throughout its distribution except for a few populations along and near the Rio Grande, is also disjunct between New Mexico/west Texas and the gypsum of north Texas, western Oklahoma, and southern Kansas (Turner, 1975).

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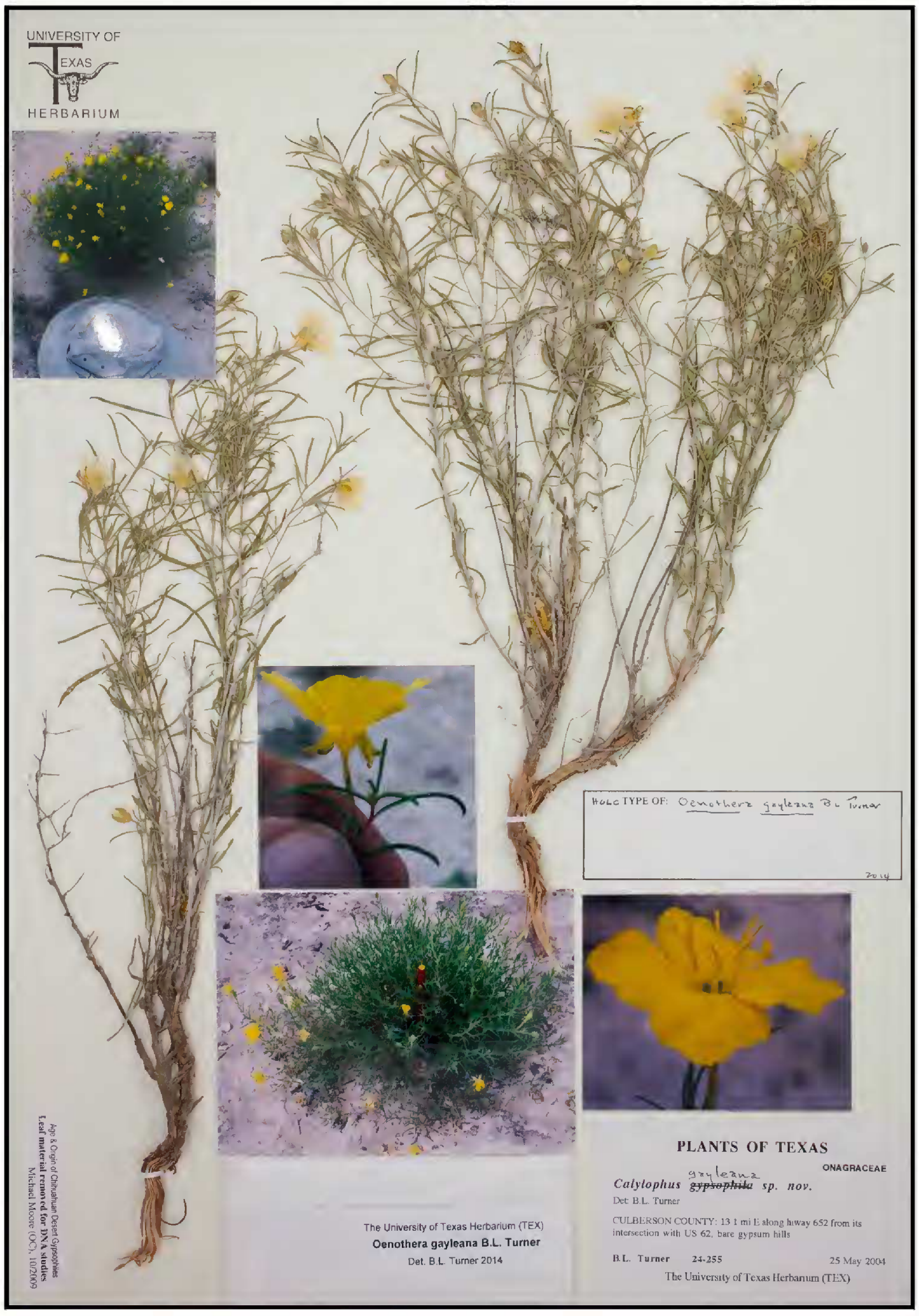

Fig. 1. Holotype of *Oenothera gayleana* (TEX).

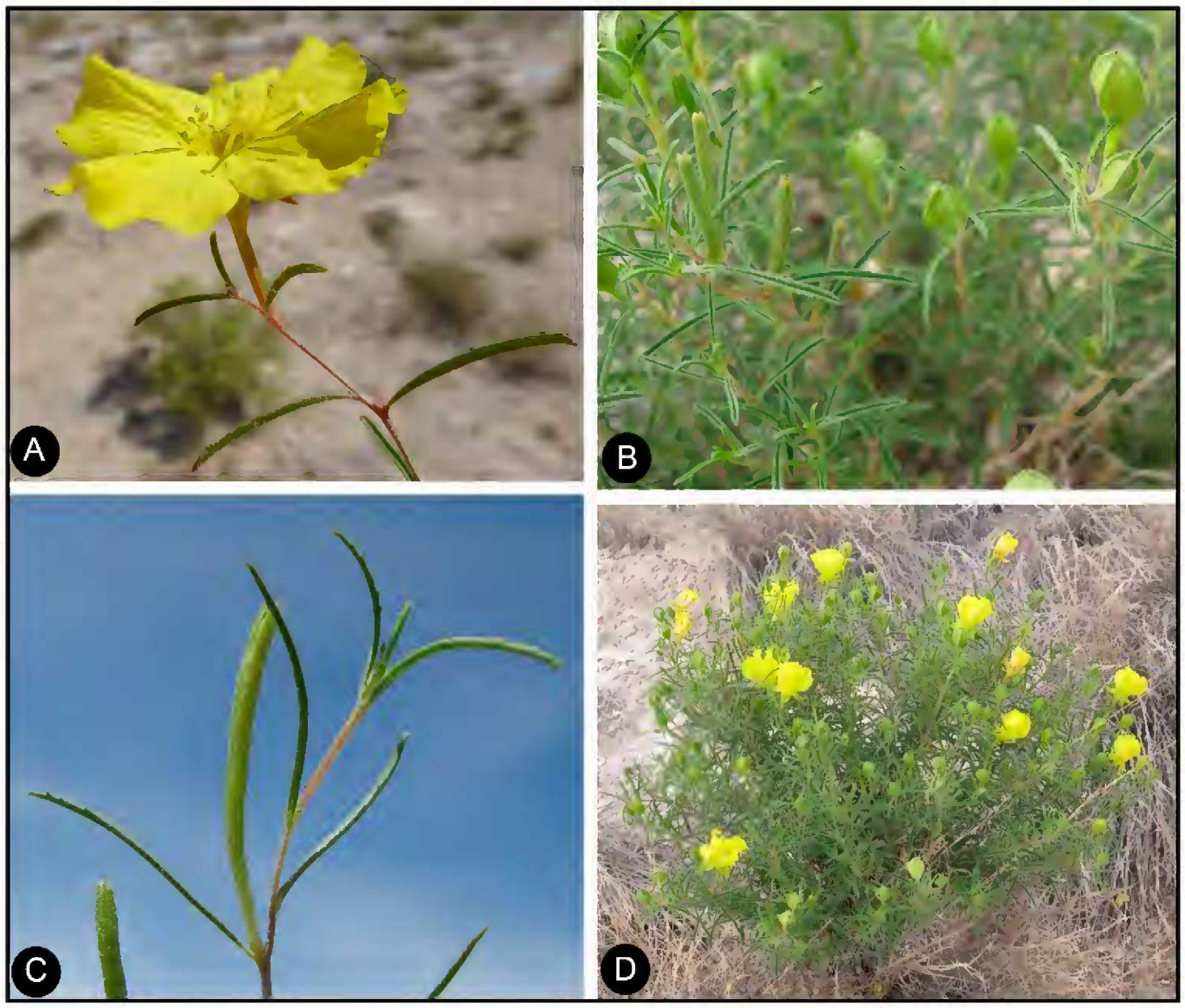

Fig. 2. Images of *Oenothera gayleana* in the field: (A) flower and leaves; (B) leaves, flower buds, and immature fruits; (C) leaves and immature fruit; (D) habit.

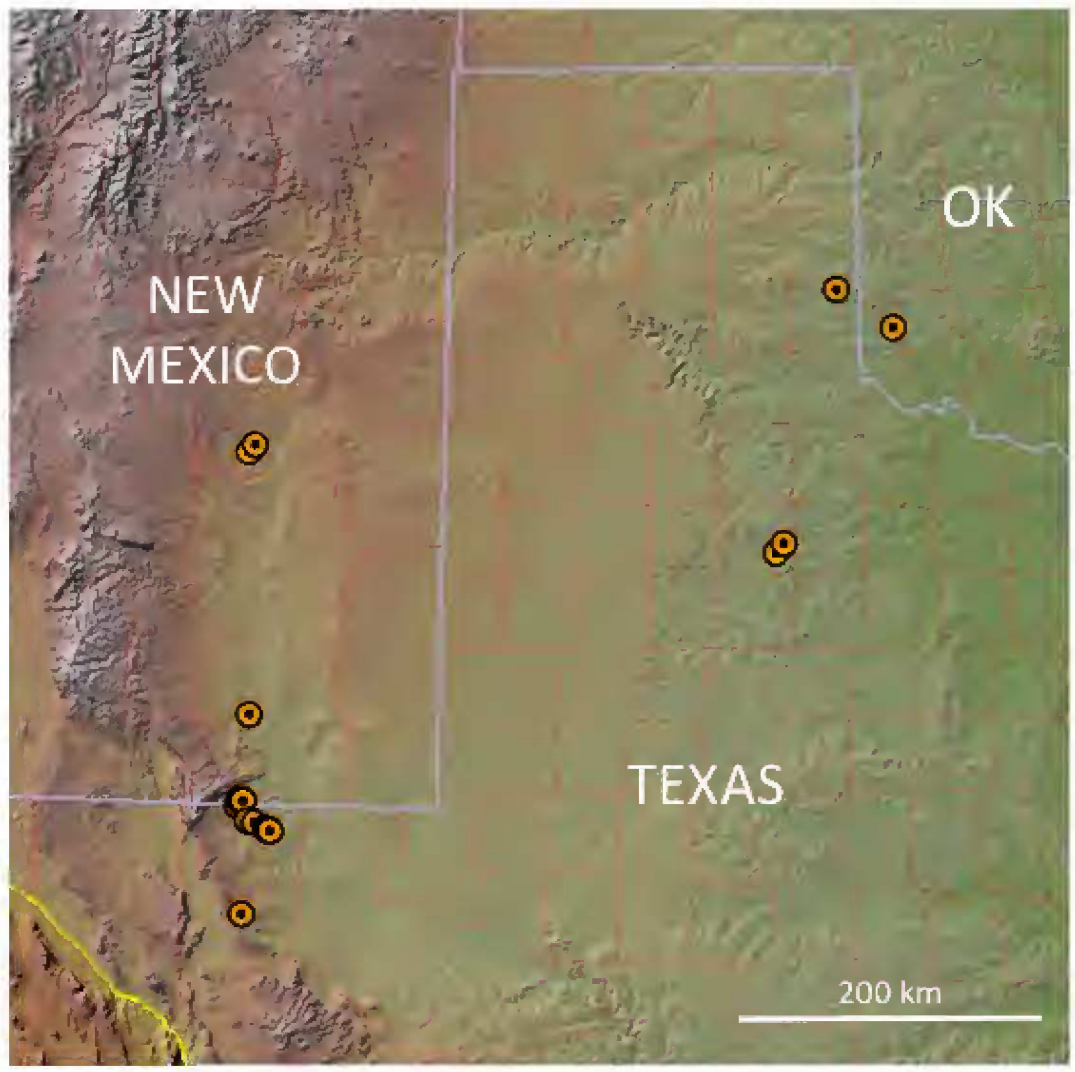

Fig. 3. Distribution of *Oenothera gayleana*.

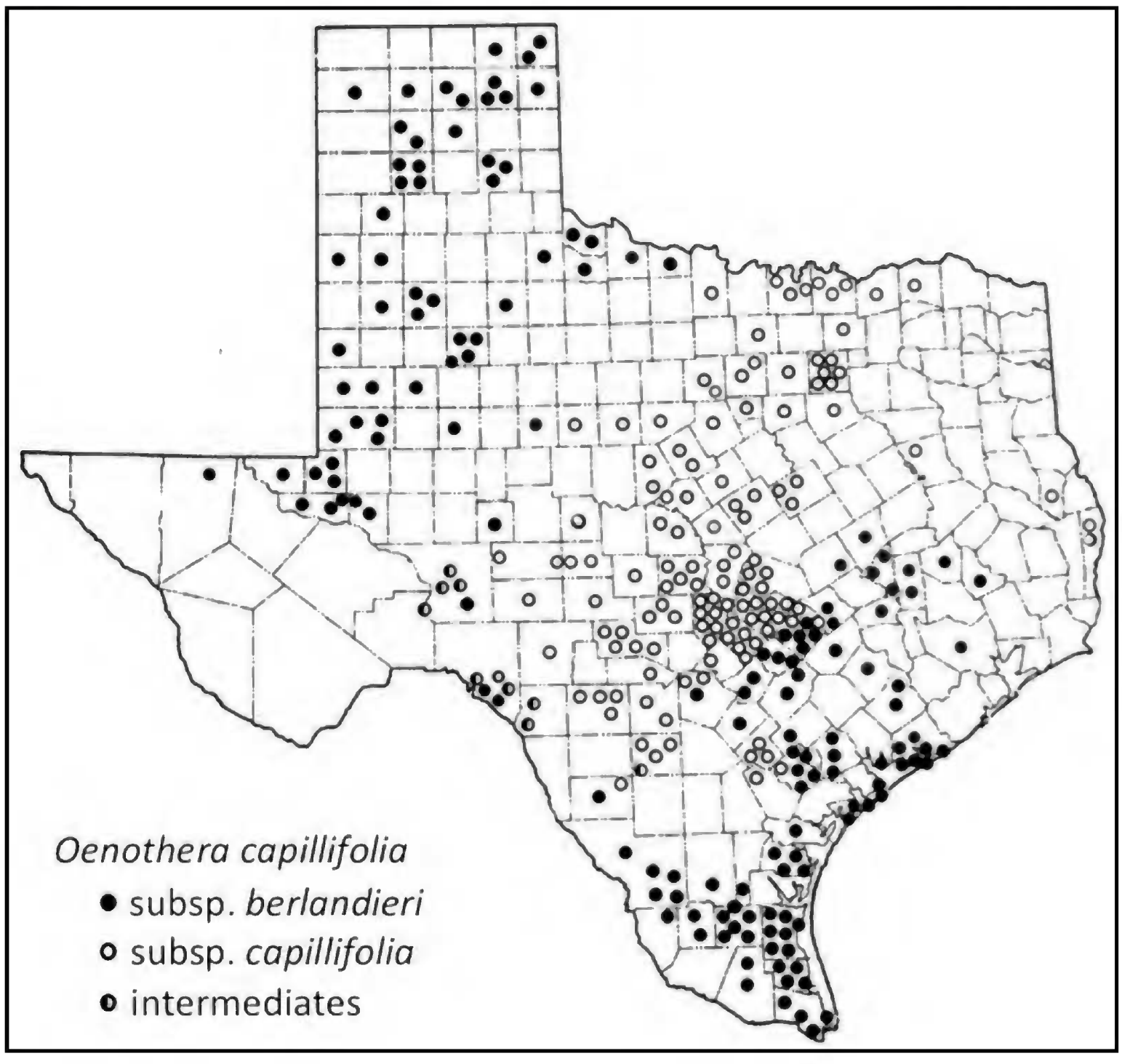

Fig. 4. Distribution of *Oenothera capillifolia* in Texas.